

4. GEOGRAPHIC DISTRIBUTION OF FISHING ACTIVITY BY GEAR TYPE

The information in this section of the document was compiled as part of an overall effort to determine the potential effects of fishing on benthic marine habitats in the Northeast Region. The objective of this information compilation was to calculate the spatial distribution of fishing activity by the principal gear types used in regional commercial fishing operations. The data used in these calculations were extracted from the NOAA Fisheries Service fishing vessel trip report (FVTR) and clam logbook databases for the years 1995-2001. The clam logbook program was implemented in 1991, and the FVTR data collection program in 1994, to monitor the geographic distribution of catches of federally regulated species in the region. Both data collection systems are mandatory, and the data are collected by fishermen. This is the first time that either of these databases has been utilized for estimating the spatial distribution of fishing activity throughout the region.

Previous attempts to determine the spatial distribution of fishing activity in the Northeast Region have been restricted to a single gear type -- bottom otter trawls -- and have described trawling activity that occurred during the mid-1980s and early 1990s, before the closing of three areas on Georges Bank to all gear used to catch groundfish, including bottom trawls and scallop dredges. These closures, which were implemented in December 1994 (see Figure 4.1) as part of an overall effort to restore depleted groundfish stocks, greatly affected the subsequent distribution of trawling and dredging operations in the region. Additional year-round groundfish closures (also shown in Figure 4.1) were established in the western GOM in May 1998, and in the vicinity of Cashes Ledge in the central GOM in August 2001.

Earlier analyses of bottom trawling activity in the region relied on information collected by NOAA Fisheries Service port agents who interviewed fishermen after their vessels returned to port. Interviews were conducted for about 60% of all trips. Data from interviewed trips included the number of days (to the nearest 0.1 day) that a vessel trawled in each 10' "square" (TMS) of latitude and longitude. (A TMS represents 10' (*i.e.*, one-sixth of a degree) of latitude along each side, and 10' of longitude along the top and bottom. Because of the curvature of the earth's surface, TMSs north or south of the Equator are actually rectangles that diminish in size as the meridians of longitude converge at the poles. Within the range of latitudes in the Northeast Region, TMSs range in size from 109.65 km² in the south to 94.20 km² in the north. Because the projection used to display the FVTR and clambook data in this document is a Mercator projection, the TMSs in Figures 4.2-4.13 appear to be the same size.) Interview information (average numbers of days fishing per trip) was applied to the noninterviewed trips, but the estimated fishing time for these trips was assigned to 30' squares.

(One 30' square is one-half of a degree of latitude and longitude on each side, and contains nine TMSs.) Churchill (1989) used data from all trips made in 1985 to estimate the percentage of area trawled in individual 30' squares between Cape Cod and North Carolina, using an average trawl width (door to door, while underway) of 40 m, and an average towing speed of 5.5 km/hr. These same methods were applied to data collected by port agents in 1993 for Georges Bank and the GOM (analysis by Churchill in NRC 2002).

A more recent analysis of 1991-1993 data for interviewed and noninterviewed bottom trawl trips was prepared for a National Research Council report on trawling and dredging effects (NRC 2002). In this case, the results for 10' and 30' squares were combined in one map, and displayed as low, medium, and high numbers of days of fishing per 10' square. No attempt was made to estimate the area swept by the gear within each square. This analysis was flawed by the fact that the extrapolated 30'-square fishing effort estimates were assigned to the single 10' square at the center of each 30' square. This biases the results and produces a "checkerboard" effect in the mosaic of 10' squares.

METHODS

Data Analysis

The geographic distribution of fishing activity during 1995-2001 was calculated by TMS for 12 commonly used, bottom-tending gear types in the Northeast Region. Data reported south of Cape Hatteras (35°N) and north of 45°N latitude in the GOM were excluded from analysis. Data for gear used mostly in state waters and/or for gear that is not well represented in the FVTR or clam logbook databases (*e.g.*, mussel and sea urchin dredges, nonhydraulic quahog dredges, Danish seines, shrimp pots) or for gear that does not normally contact the bottom (*e.g.*, purse seines, mid-water trawls, pelagic longlines, floating gill nets) were not analyzed.

The FVTR and clam logbook data are provided by vessels operating with federal permits and participating in the following fisheries: Northeast multispecies, sea scallop, surf clam and ocean quahog, goosefish, summer flounder, scup, black sea bass, squid, Atlantic mackerel, butterfish, spiny dogfish, bluefish, Atlantic herring, and tilefish. There is no requirement for vessels permitted in just the offshore lobster fishery to report or log their activities. However, vessels permitted in both the offshore lobster and Northeast multispecies fisheries must report on their lobster fishing activity. Consequently, the data for lobster pots were provided by those vessels with multispecies and offshore lobster permits.

Vessels that operate strictly within state waters (0-3 mi from shore) are not required to have a federal permit, and therefore do not submit trip reports. For this reason, fishing trips in nearshore TMSs that include a significant proportion of state waters are under-represented in the data.

Permit holders are required to fill out a FVTR form or make a logbook entry for each trip made by the vessel (*i.e.*, each time the vessel leaves and returns to port). Fishermen report the general location where most of their fishing effort occurs during a trip, and the date and time that the vessel leaves and returns to port. (Fishermen are also asked to answer questions regarding the quantity and size of gear used during a trip, how many tows or sets were hauled, and what was the average tow or soak time. However, because this information is either not reported at all, or is reported in an inconsistent manner, it is not reliable and was not used in this analysis.) Fishermen are also given the choice of reporting the location of a trip as a point (*i.e.*, latitude and longitude) or simply assigning it to a statistical area (these areas are quite large and include many TMSs). Only trips that were reported as a point location and therefore could be assigned to a TMS were included in this analysis. Most trips are reported this way, but not all (Table 4.1).

For most of the analyzed, mobile, bottom-tending gear (*i.e.*, scallop dredges and three types of otter trawl), fishing activity was calculated as the total number of days absent from port during the 7-yr period. Days absent for each scallop dredge and otter trawl trip were calculated based on the date and time of departure from, and return to, port in hours, and were then converted to fractions of 24-hr days. Days-absent calculations for trawl and scallop dredge vessels are clearly preferable to simply summing the number of trips, but overestimate actual fishing time since they include travel time and any other non-fishing-related activity while the vessels are away from port. For clam dredges, fishing activity was calculated as the actual hours spent fishing during the 7-yr period, and was then converted to fractions of 24-hr days. For fixed gear (*i.e.*, bottom longlines, sink gill nets, and five types of pots), fishing activity was calculated as the total number of trips during the 7-yr period.

This method of compiling the data by TMS was considered to be preferable to plotting individual trip locations as point data, since many trips, especially for vessels using mobile gear, last for many days and can extend over fairly large areas. For these trips, even data compiled by TMS only approximate the actual spatial distribution of fishing activity throughout the region. For trips of shorter duration that do not extend over large areas, the figures in this document are more representative of actual fishing activity distributions. For this reason, and because some fishing trips in the FVTR database are not assigned to a point location and could not be included in this analysis, the values associated with each TMS are not provided in this document.

Data Portrayal

The calculated data have been portrayed in Figures 4.2-4.13 using geographical information systems (GIS) software (ArcView 3.2, ESRI, Inc.). These geographic portrayals of the relative nature of fishing activity for each gear type were achieved by ranking the TMSs in order from those with the most fishing activity to those with the least activity. TMSs were categorized according to the cumulative percentage of the overall activity (*i.e.*, the total number of days or trips during the 7-yr time period) which they represented.

Those TMSs which had the most activity and which cumulatively accounted for 50% of the overall activity were assigned to a “high” or 50th percentile category. Those TMSs which cumulatively accounted for the next 25% of overall activity were assigned to a “medium” or 75th percentile category. Those TMS which cumulatively accounted for the next 15% of overall activity were assigned to a “low” or 90th percentile category. For the 9 of the 12 gear types that had <100,000 trips or days of fishing reported during the 7-yr period, just the 50th, 75th, and 90th percentile categories were portrayed. For the three gear types that had >100,000 trips or days of fishing reported during the 7-yr period, the 95th percentile category was also portrayed. Exclusion of extreme “low end” data (*i.e.*, those TMSs which would fall into a higher percentile category than 90th or 95th, as appropriate) eliminated a large number of spatially misreported trips from the figures.

Fishing activity categories in the figures are labeled according to the range in the number of days or trips that were reported within each TMS. Tables 4.2 and 4.3 show the ranges, the total amount of fishing activity represented by all the TMSs in each category, and the total amount of fishing activity (100% of the frequency distribution of days or trips) throughout the region for each gear type.

RESULTS

Bottom Otter Trawls -- Fish

Most of the reported otter trawl activity during 1995-2001 was directed at the capture of fish (Figure 4.2) rather than shrimp or scallops (Figures 4.3 and 4.4). There was more than twice as much fishing activity reported for this gear than for scallop dredges (Table 4.2). Bottom otter trawling for fish was widespread in coastal and offshore waters throughout most of the Northeast Region, easily accounting for more TMSs than any other gear (Figure 4.14). Areas of highest activity were located in southwestern and central portions of the GOM, along the western side of the Great South Channel (east of Cape Cod), north of Closed Area I and on the northern part of Georges Bank west of Closed Area II, in coastal waters of Rhode Island and Long Island, in the mid-shelf region of

Southern New England, and along the edge of the shelf, especially along the 40th parallel of N latitude between 70° and 73° W longitude and in the Hudson Canyon area. Bottom trawling was prohibited in the three groundfish closed areas on Georges Bank during the entire 1995-2001 period, and was absent, or nearly so, in a large area of the continental shelf off southern New Jersey, Maryland, and Virginia. The distribution of fish trawling activity among TMSs within the range fished by this gear was intermediate [*i.e.*, it was neither heavily concentrated nor widely dispersed (Figure 4.15)].

Bottom Otter Trawls -- Shrimp

Shrimp trawling was localized in two areas: the coastal waters of the GOM between Cape Ann and Penobscot Bay, and in nearshore waters of North Carolina, particularly inside the barrier islands (Figure 4.3). Shrimp trawling was reported within a relatively small number of TMSs (Figure 4.14), and was evenly distributed among those TMSs (Figure 4.15). The total number of reported days at sea was also fairly low (Table 4.2).

Bottom Otter Trawls -- Sea Scallops

Scallop trawling was conducted on the outer Mid-Atlantic shelf, primarily between 40° and 37°N (Figure 4.4). The total number of reported days absent from port and the total number of “populated” TMSs were low (Table 4.2; Figure 4.14). Scallop trawling was concentrated in a small proportion of the total number of TMSs where this gear was used (Figure 4.15).

Scallop Dredges

Scallop dredges were used primarily in a broad area of the Mid-Atlantic shelf from Long Island to Virginia, in Massachusetts Bay (north of Cape Cod) and the Great South Channel, in localized TMSs on Georges Bank northeast of Closed Area I and west of the northern portion of Closed Area II, and in a larger area on the southeast flank of the bank that included the southern portion of Closed Area II that was opened to limited scallop dredging in 1999 (Figure 4.5). Some scallop dredging was also reported from eastern Maine coastal waters. No active scallop dredging was reported in shallow open areas on Georges Bank, in Southern New England, nor in inner shelf waters of the MAB. Some scallop dredging also occurred in portions of the other two closed areas on Georges Bank that were temporarily opened to this gear during 1995-2001. Compared to the other gear types, the number of TMSs with reported scallop dredging covered an area of intermediate size (Figure 4.14), and fishing activity was fairly evenly distributed among TMSs (Figure 4.15).

Hydraulic Clam Dredges

The largest area of intensive hydraulic clam dredging activity was located off the central New Jersey coast, with smaller areas extending north and east to Southern New England and south to the Delmarva Peninsula (Fig. 4.6). The total number of TMSs within which clam dredging took place during 1995-2001 was low (Figure 4.14), and fishing was concentrated in a relatively small proportion of those TMSs (Figure 4.15).

Bottom Longlines

Longline trips during 1995-2001 were reported primarily in TMSs in the western GOM (Massachusetts Bay) and along the western side of the Great South Channel (Figure 4.7). A few trips were reported in deep water along the edge of the shelf, in Rhode Island and central Maine coastal waters, and in offshore locations of the GOM. The total number of TMSs within which bottom longlines were used was relatively low (Figure 4.14), and fishing was evenly distributed among those TMSs (Figure 4.15).

Bottom Gill Nets

Bottom gill net trips were reported in the western GOM and along the western side of the Great South Channel, extending as far north as Cape Ann and Jeffreys Ledge, and in a few TMSs in the outer gulf (Figure 4.8). Gill nets were also used in Rhode Island coastal waters, along the outer shore of Long Island, off northern New Jersey, the Delmarva Peninsula, and in North Carolina. Gill net fishing activity was highest in the western GOM and the Great South Channel in areas that were also actively fished with longlines, bottom trawls, and scallop dredges. The total area fished, as represented by TMSs within which any amount of fishing activity was reported, was relatively large (Figure 4.14), and fishing was well distributed among those TMSs (Figure 4.15).

Lobster Pots

The lobster pot fishery is the most active fixed-gear fishery in the Northeast Region. During 1995-2001, there were almost three times as many trips reported for this gear than for bottom gill nets, the second-most actively used bottom-tending fixed gear (Table 4.3). Fishing activity for this gear is under-reported to a greater degree than for the other gears because nonfederally permitted vessels (which are active in this fishery) are not required to submit reports. Lobster pot trips were reported primarily in coastal waters of the GOM from the Canadian border to Cape Cod, in Rhode Island coastal and inner-shelf waters, and in the New York Bight (Fig. 4.9). Fewer trips were made to more

offshore locations in Southern New England, along the edge of the shelf, on eastern Georges Bank, and along the U.S.-Canada border north of the bank. Lobster pots were deployed in a very large number of TMSs within the region (Figure 4.14), and because of the large number of low-activity TMSs (which are not shown in Figure 4.9), their use was very evenly distributed among those TMSs (Figure 4.15).

Fish Pots

Most fish pot trips were reported on the south shore of Massachusetts and Rhode Island, Long Island, and off southern New Jersey, Delaware, and Maryland (Fig. 4.10). Other areas where fewer trips were reported were located on Jeffreys Ledge in the western GOM, east of Long Island and south of Nantucket and Martha's Vineyard, along the outer edge of the continental shelf in the southern MAB, and off the entrance to Chesapeake Bay. Fish pot trips were reported from a small number of TMSs during 1995-2001 (Figure 4.14), and the even-ness of their distribution among TMSs was intermediate between the heavily concentrated (*e.g.*, crab and hagfish pots) and more evenly dispersed (*e.g.*, lobster pots) fixed gears (Figure 4.15).

Whelk Pots

Most fishing activity was reported in Nantucket Sound and inshore waters of southern Massachusetts, in a single TMS south of Rhode Island, and in coastal waters of southern New Jersey and the Delmarva Peninsula, extending south to North Carolina (Fig. 4.11). Fishing with this gear was reported within a very small number of TMSs (Figure 4.14), and was less evenly distributed among TMSs than fishing with fish pots, but more evenly distributed than crab or hagfish pot trips (Figure 4.15).

Crab Pots

Crab pot trips were reported in a small number of TMSs in deep water along the edge of the shelf from eastern Georges Bank all the way to Cape Hatteras, in a single TMS south of Nantucket, in several nearshore locations in the GOM, Nantucket Sound, Cape May, and in inshore waters behind the North Carolina barrier islands (Fig. 4.12). Very few trips were reported (Table 4.3). Fishing was very spread out among a few isolated TMSs (Figure 4.14), but was highly concentrated within those few TMSs (Figure 4.15).

Hagfish Pots

Hagfish pots were used exclusively in the southwestern GOM, in both shallow and deep water (Figure 4.13). Only a few trips were reported within a small number of TMSs (Table 4.3; Figure 4.14), and fishing activity was very un-evenly distributed among TMSs (Figure 4.15).

Table 4.1. Total number of trips by gear type in the FVTR database for 1995-2000, before and after removing trips that did not meet the criteria established for analysis (see text), and the percentage of analyzed trips (information for 2001 was not available)

Gear Type	Reported Trips	Analyzed Trips	Percent Analyzed
Bottom gill net	86,580	66,096	76.3
Bottom longline	18,261	13,614	74.6
Lobster pot	241,725	171,564	71.0
Fish pot	13,323	9,779	73.4
Crab pot	1,609	1,050	65.3
Whelk pot	2,448	1,700	69.4
Bottom otter trawl (fish)	218,668	174,617	79.9
Bottom otter trawl (shrimp)	43,353	30,865	71.2
Bottom otter trawl (scallops)	1,952	1,702	87.2
Scallop dredge	32,248	23,206	72.0
TOTAL	660,167	494,193	74.8

Table 4.2. Fishing activity reported by federally-permitted fishing vessels using mobile, bottom-tending gears in the Northeast Region (35-45°N) during 1995-2001. (Data shown as ranges in number of 24-hr days per 10' square (TMS) of latitude and longitude, and as cumulative number of 24-hr days (in parentheses), associated with percentiles of total reported fishing activity that are mapped in Figures 4.2-4.6. Number in last column is the total number of days at sea in all TMSs in the region for that gear type, as calculated from the time absent from port for each reported trip. Note: Not all trips in fishing vessel trip database could be assigned to TMSs (see Table 4.1).)

Gear	Activity Metric	Percentile of Fishing Activity				
		50%	75%	90%	95%	100%
Otter trawls (fish)	Days absent from port	603-5,058 (175,907)	333-602 (263,176)	136-331 (315,582)	63-135 (333,105)	348,841
Otter trawls (shrimp)	Days absent from port	409-1,677 (11,837)	137-399 (17,986)	32-136 (21,591)	---	23,891
Otter trawls (scallops)	Days absent from port	183-653 (5,888)	66-175 (8,816)	16-66 (10,596)	---	11,720
Scallop dredges	Days absent from port	732-3,371 (78,831)	338-724 (118,850)	95-333 (142,493)	34-93 (150,392)	157,507
Hydraulic clam dredges	Days fishing	133-517 (8,027)	64-126 (11,990)	31-63 (14,412)	---	15,951

Table 4.3. Fishing activity reported by federally-permitted fishing vessels using fixed gear in the Northeast Region (35-45°N) during 1995-2001. (Data shown as ranges in number of trips per 10' square (TMS) of latitude and longitude, and as cumulative number of trips (in parentheses) associated with percentiles of total reported fishing activity that are mapped in figures 4.7-4.13. Number in last column is the total number of trips reported in all TMSs in the region for that gear type. Note: Not all trips in fishing vessel trip database could be assigned to TMSs (see Table 4.1).)

Gear	Activity Metric	Percentile of Fishing Activity				
		50%	75%	90%	95%	100%
Bottom longlines	Trips	412-1,269 (8,211)	129-314 (12,345)	11-126 (14,914)	---	16,483
Bottom gill nets	Trips	520-3,831 (43,194)	167-511 (65,220)	50-167 (78,156)	---	86,403
Lobster pots	Trips	2,084-10,895 (115,726)	816-2,009 (173,326)	161-759 (208,362)	45-160 (219,906)	230,300
Fish pots	Trips	120-434 (4,740)	41-118 (7,088)	9-39 (8,523)	---	9,423
Whelk pots	Trips	109-260 (1,172)	21-86 (1,859)	8-20 (2,235)	---	2,471
Crab pots	Trips	89-227 (678)	13-44 (1,093)	2-13 (1,312)	---	1,450
Hagfish pots	Trips	50-323 (1,202)	22-49 (1,822)	8-21 (2,195)	---	2,430

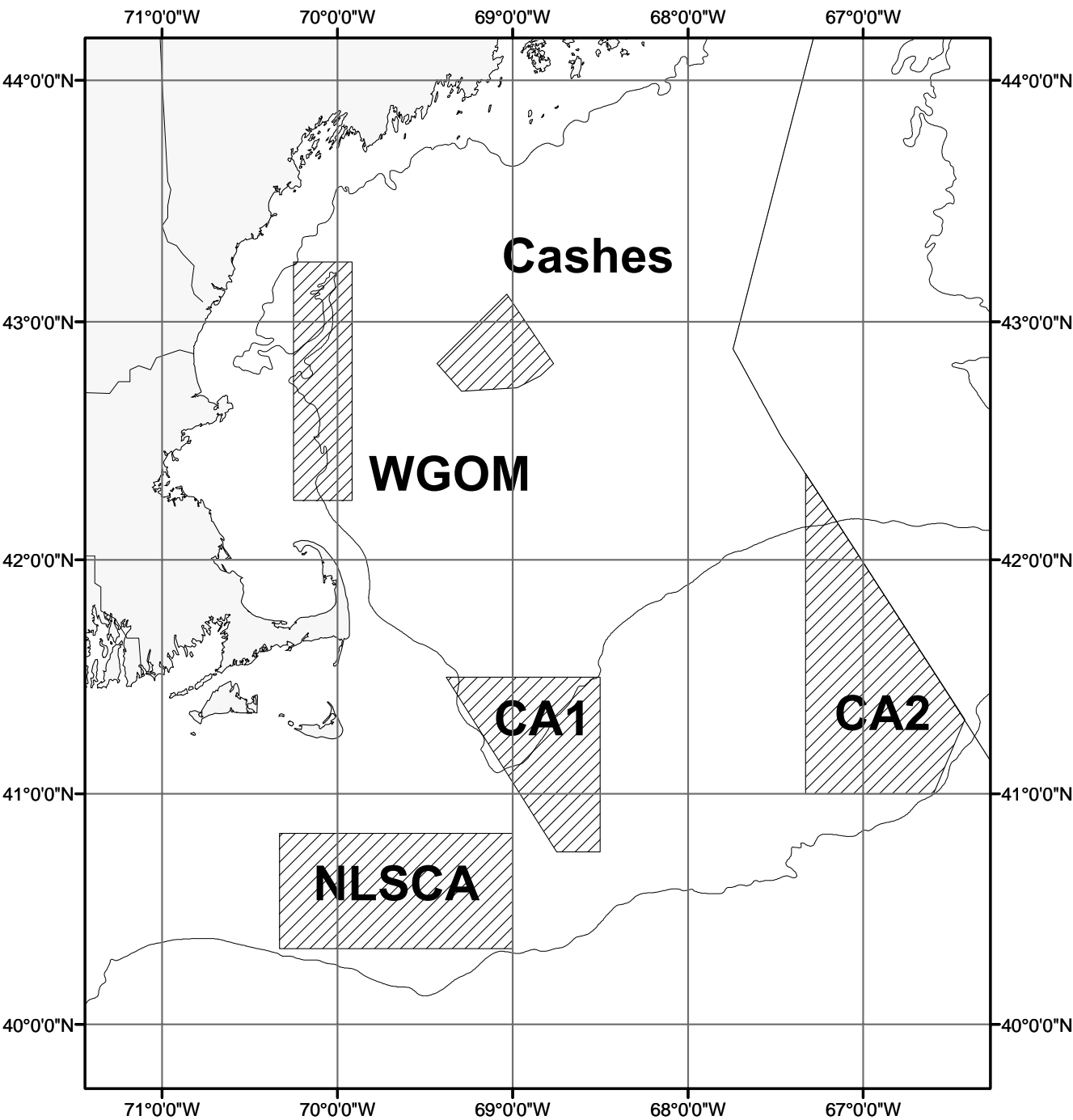


Figure 4.1. Location of five year-round groundfish closed areas in the Gulf of Maine - Georges Bank region. (Cashes = Cashes Ledge; WGOM = western Gulf of Maine; NLSCA = Nantucket Lightship Closed Area; CA1 = Closed Area I; and CA2 = Closed Area II.)

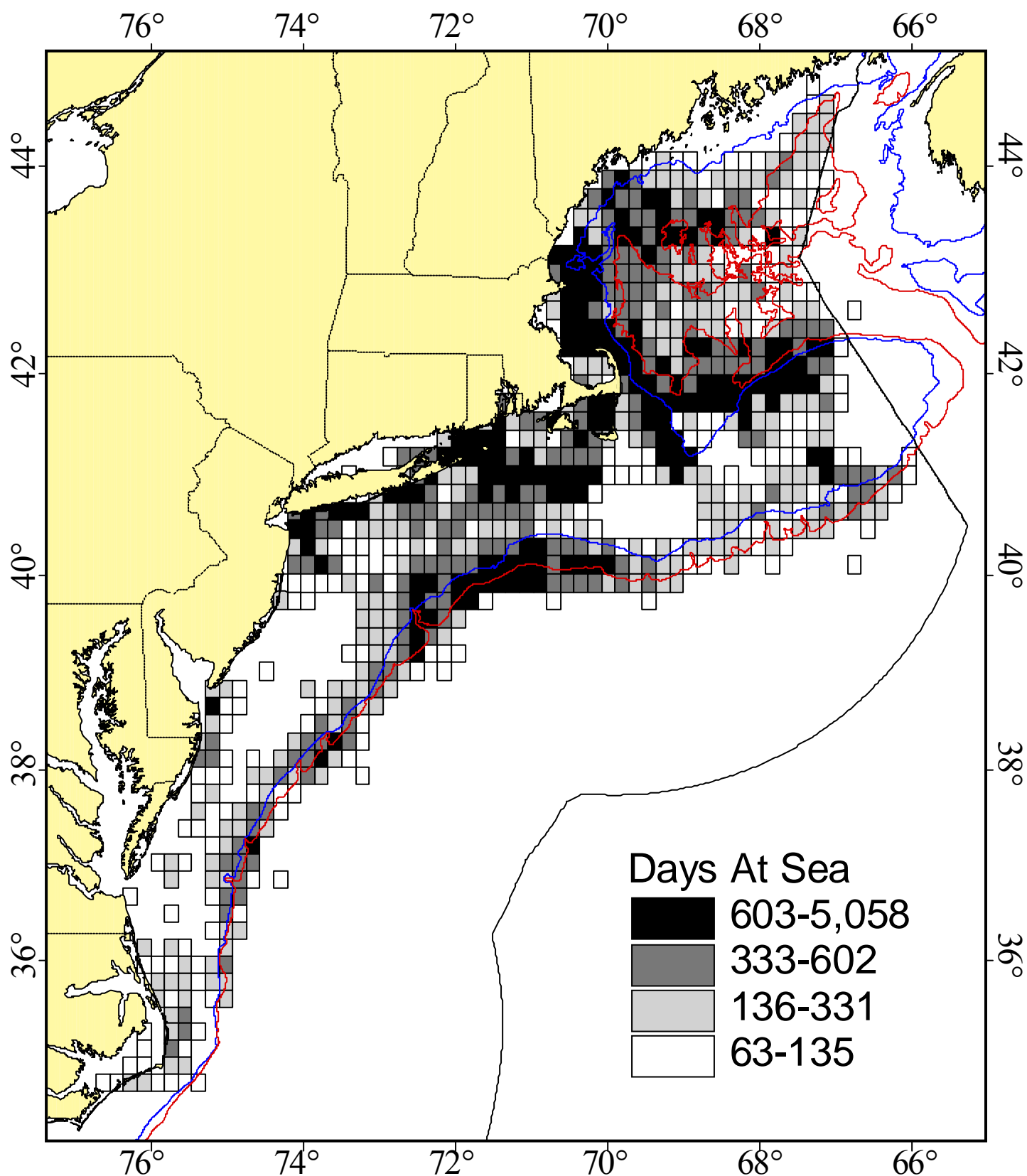


Figure 4.2. Bottom otter trawl (fish) fishing activity in the Northeast Region during 1995-2001. (Each TMS is associated with either a high (50% cumulative), medium (75% cumulative), low (90% cumulative), or very low (95% cumulative) category of fishing activity level (*i.e.*, number of 24-hr days absent from port). See the text for further explanation of cumulative percentages, or “percentiles,” and Table 4.2 for the ranges of fishing activity associated with each cumulative percentage category.)

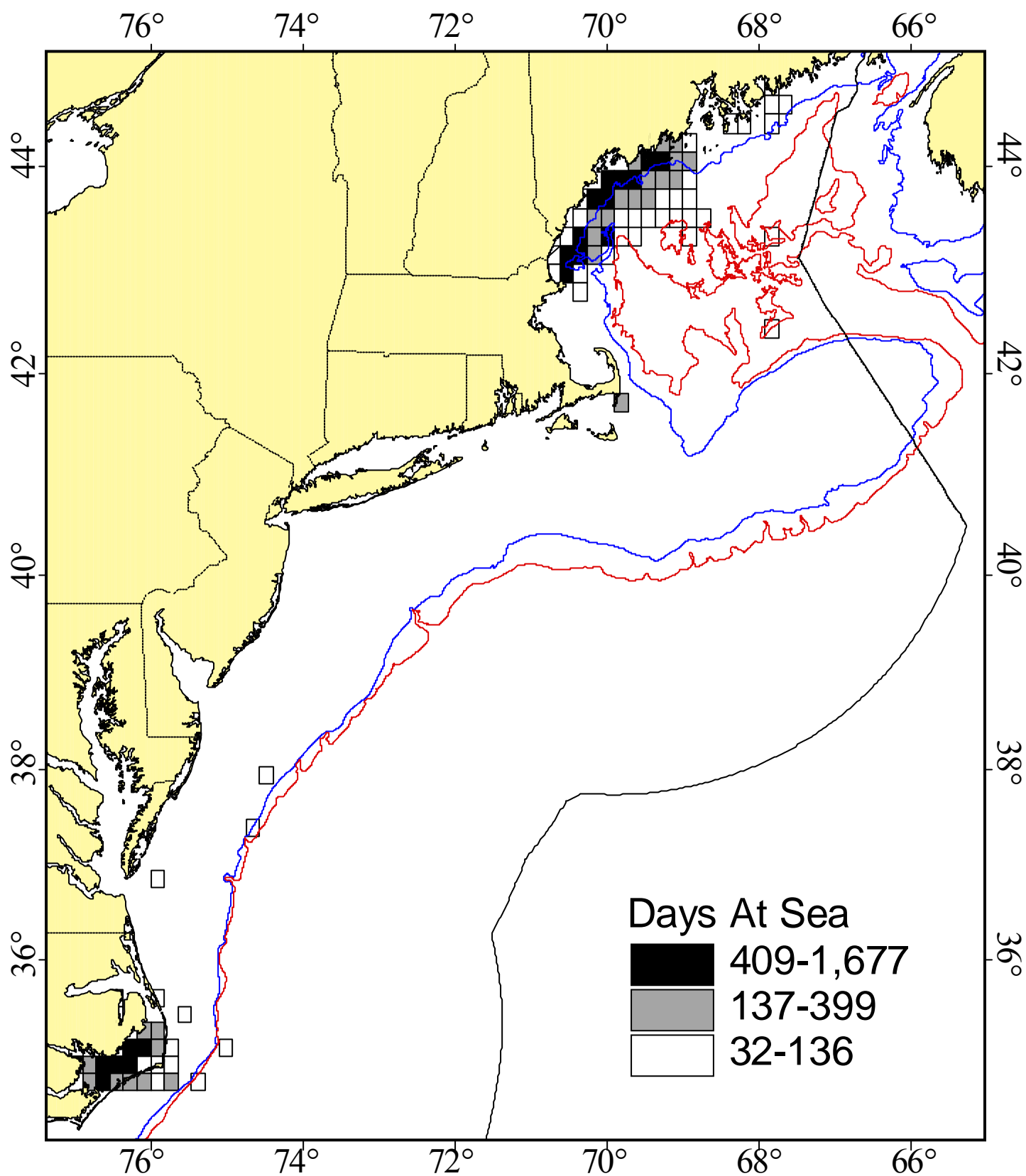


Figure 4.3. Bottom otter trawl (shrimp) fishing activity in the Northeast Region during 1995-2001. (Each TMS is associated with either a high (50% cumulative), medium (75% cumulative), or low (90% cumulative) category of fishing activity level (*i.e.*, number of 24-hr days absent from port). See the text for further explanation of cumulative percentages, or “percentiles,” and Table 4.2 for the ranges of fishing activity associated with each cumulative percentage category.)

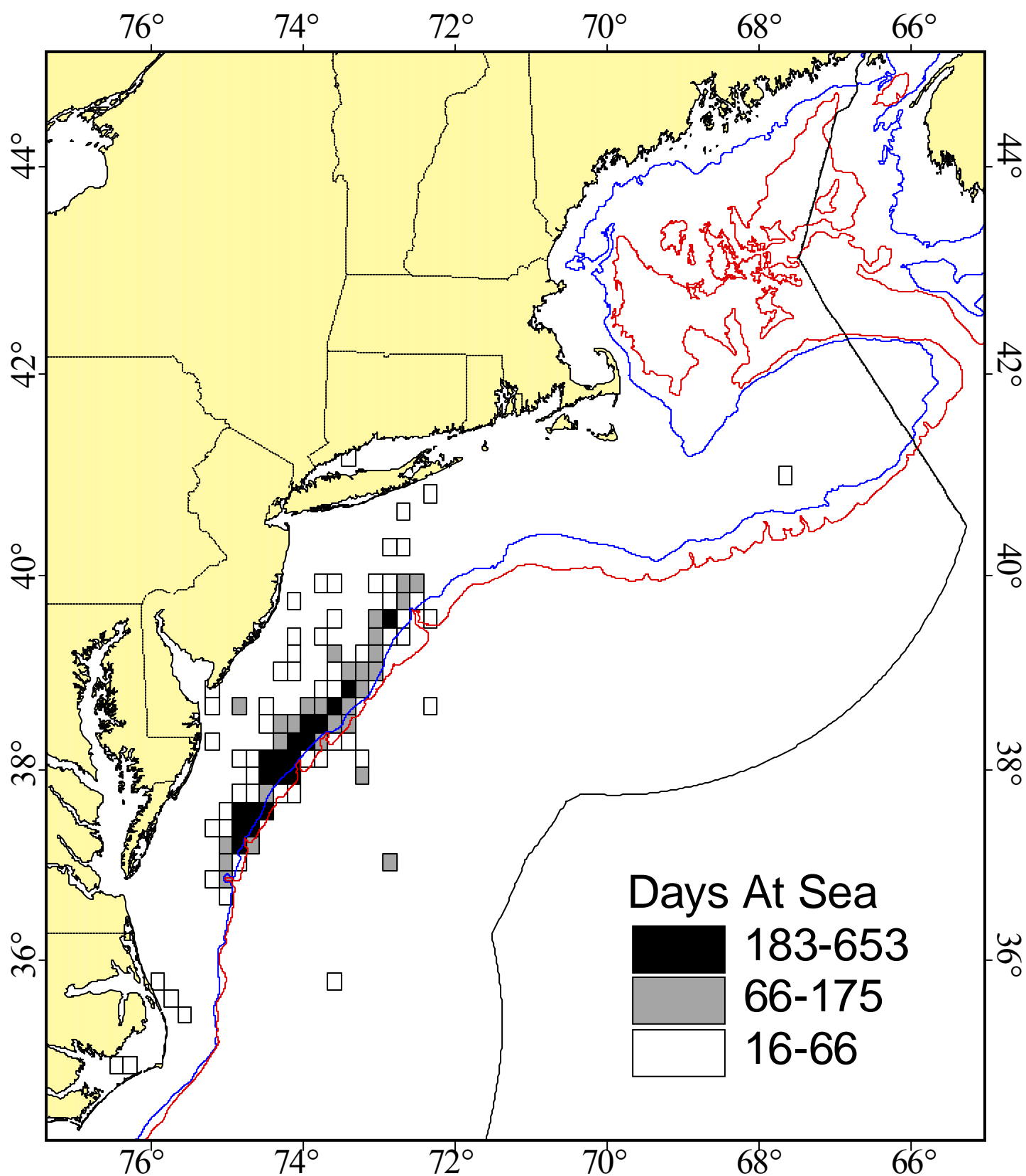


Figure 4.4. Bottom otter trawl (scallop) fishing activity in the Northeast Region during 1995-2001. (Each TMS is associated with either a high (50% cumulative), medium (75% cumulative), or low (90% cumulative) category of fishing activity level (*i.e.*, number of 24-hr days absent from port). See the text for further explanation of cumulative percentages, or “percentiles,” and Table 4.2 for the ranges of fishing activity associated with each cumulative percentage category.)

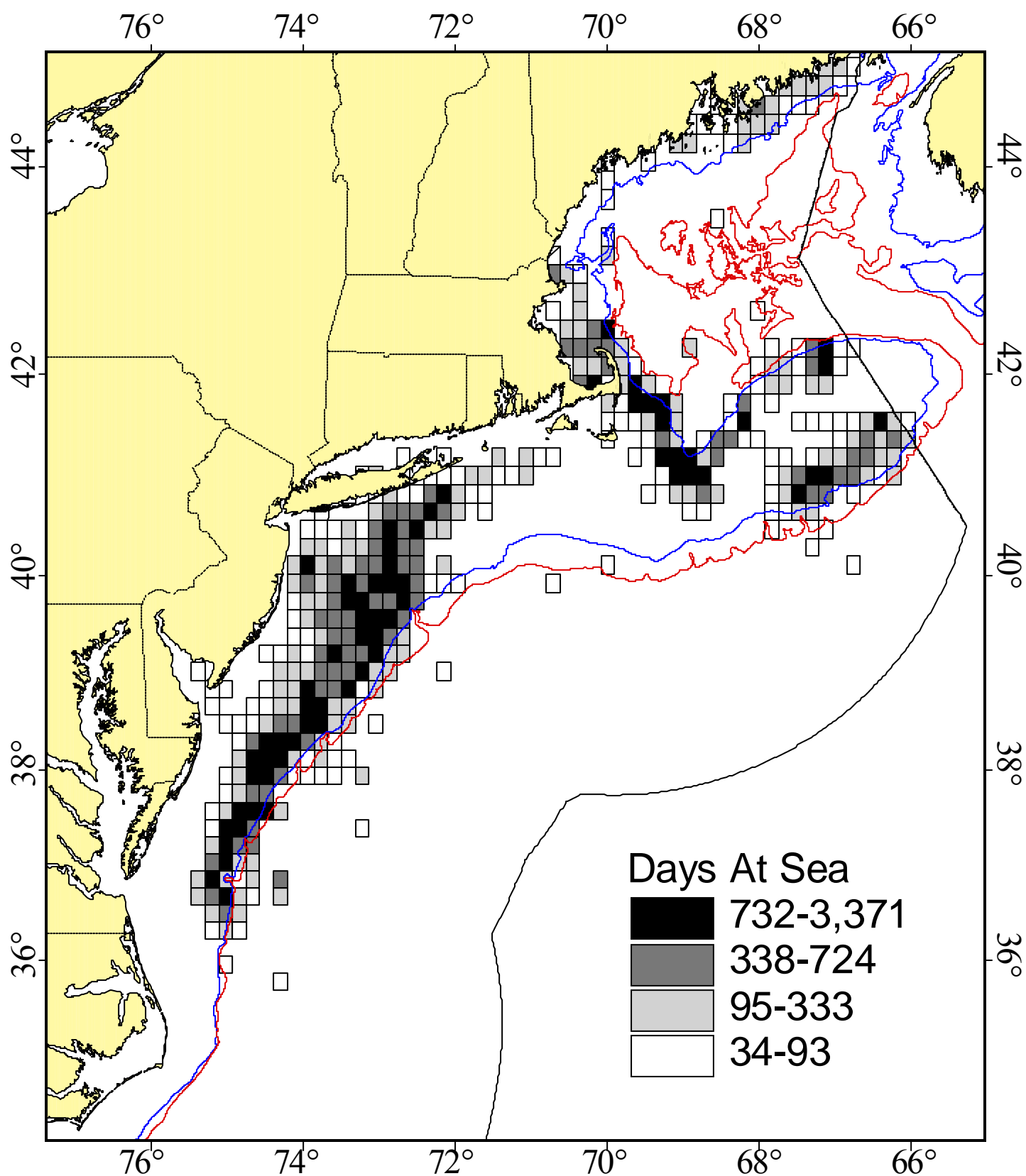


Figure 4.5. Scallop dredge fishing activity in the Northeast Region during 1995-2001. (Each TMS is associated with either a high (50% cumulative), medium (75% cumulative), low (90% cumulative), or very low (95% cumulative) category of fishing activity level (*i.e.*, number of 24-hr days absent from port). See the text for further explanation of cumulative percentages, or “percentiles,” and Table 4.2 for the ranges of fishing activity associated with each cumulative percentage category.)

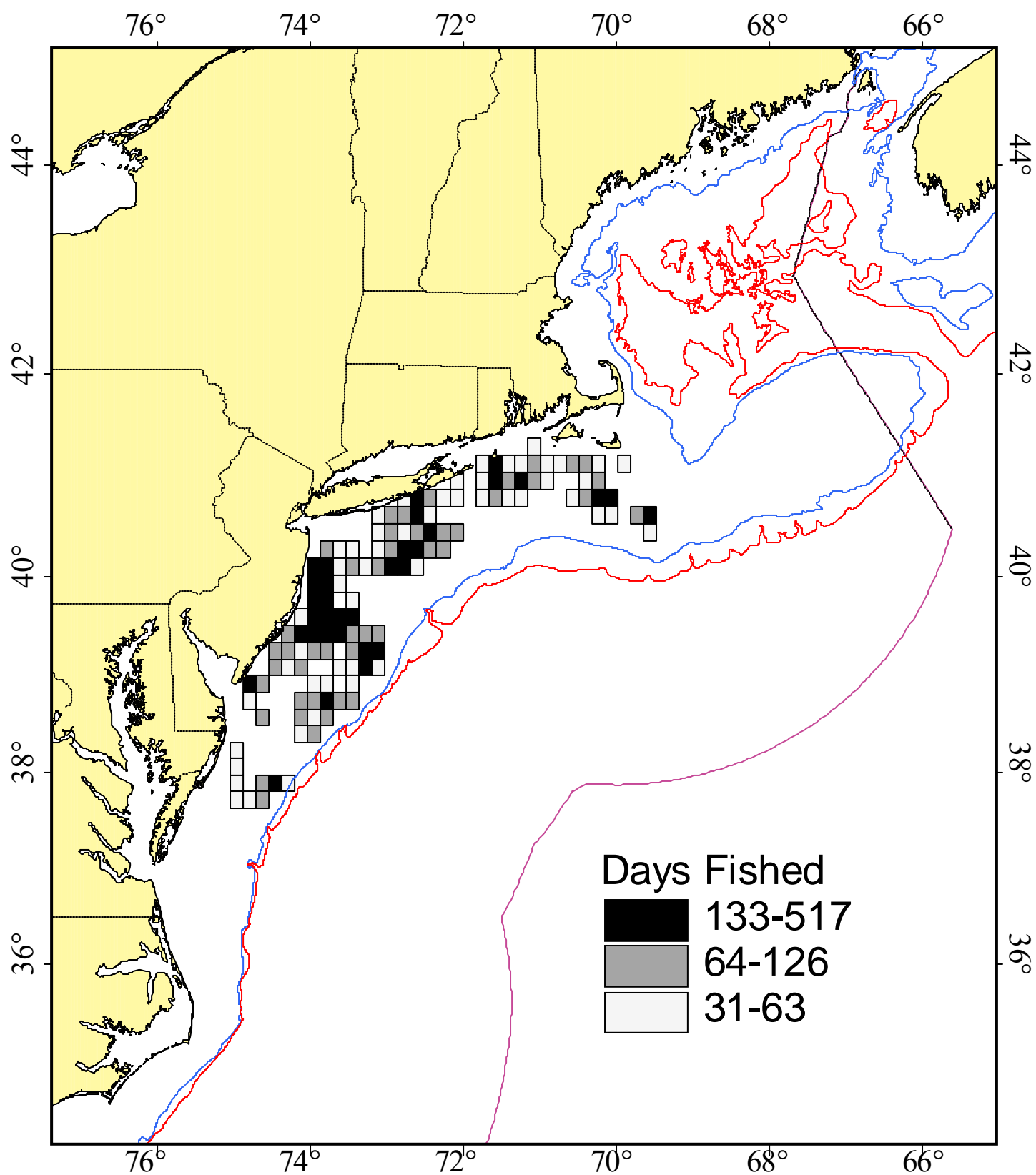


Figure 4.6. Hydraulic clam dredge fishing activity in the Northeast Region during 1995-2001. (Each TMS is associated with either a high (50% cumulative), medium (75% cumulative), or low (90% cumulative) category of fishing activity level (*i.e.*, number of 24-hr days of fishing). See the text for further explanation of cumulative percentages, or “percentiles,” and Table 4.2 for the ranges of fishing activity associated with each cumulative percentage category.)

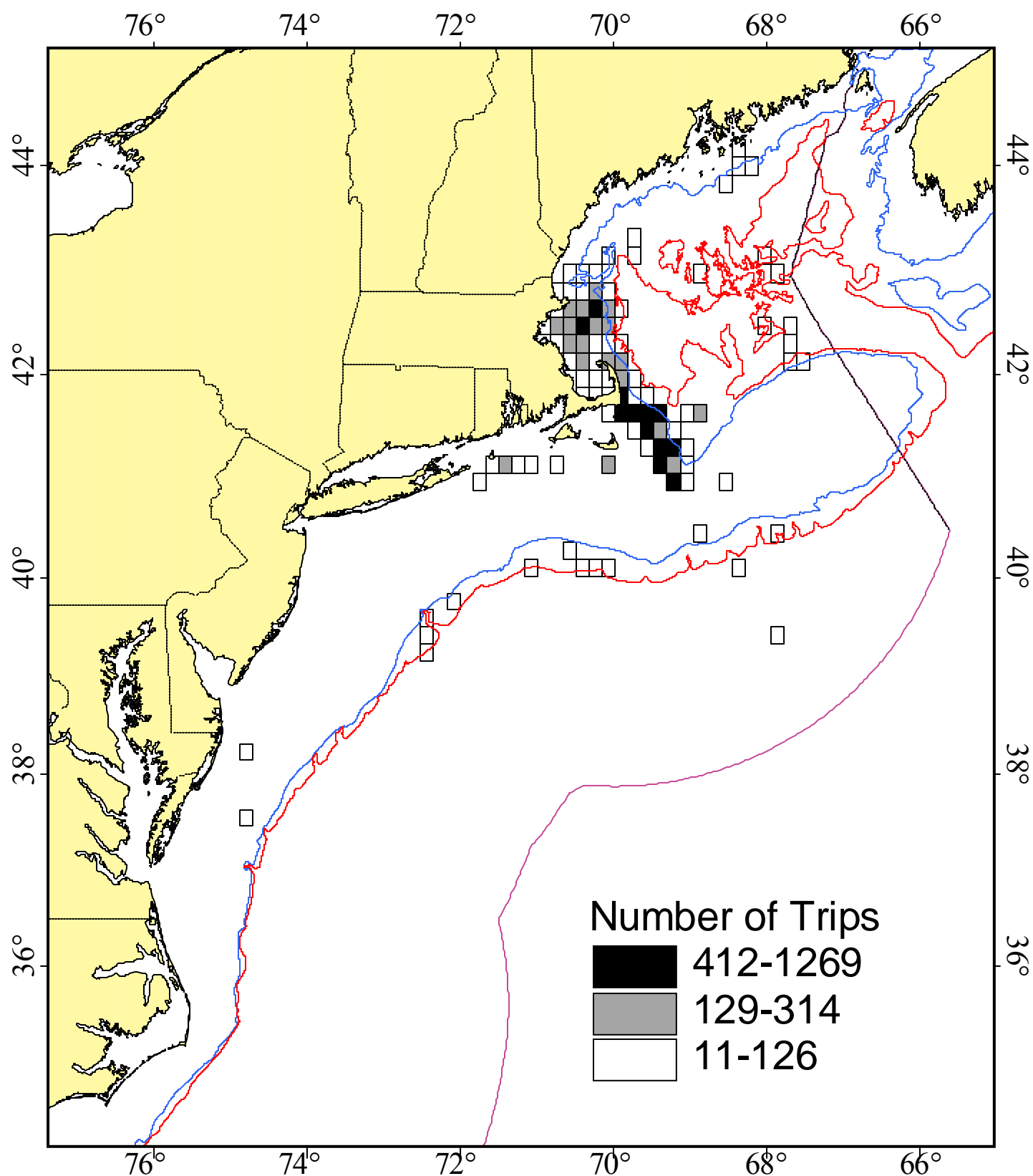


Figure 4.7. Bottom longline fishing activity in the Northeast Region during 1995-2001. (Each TMS is associated with either a high (50% cumulative), medium (75% cumulative), or low (90% cumulative) category of fishing activity level (*i.e.*, number of trips). See the text for further explanation of cumulative percentages, or “percentiles,” and Table 4.3 for the ranges of fishing activity associated with each cumulative percentage category.)

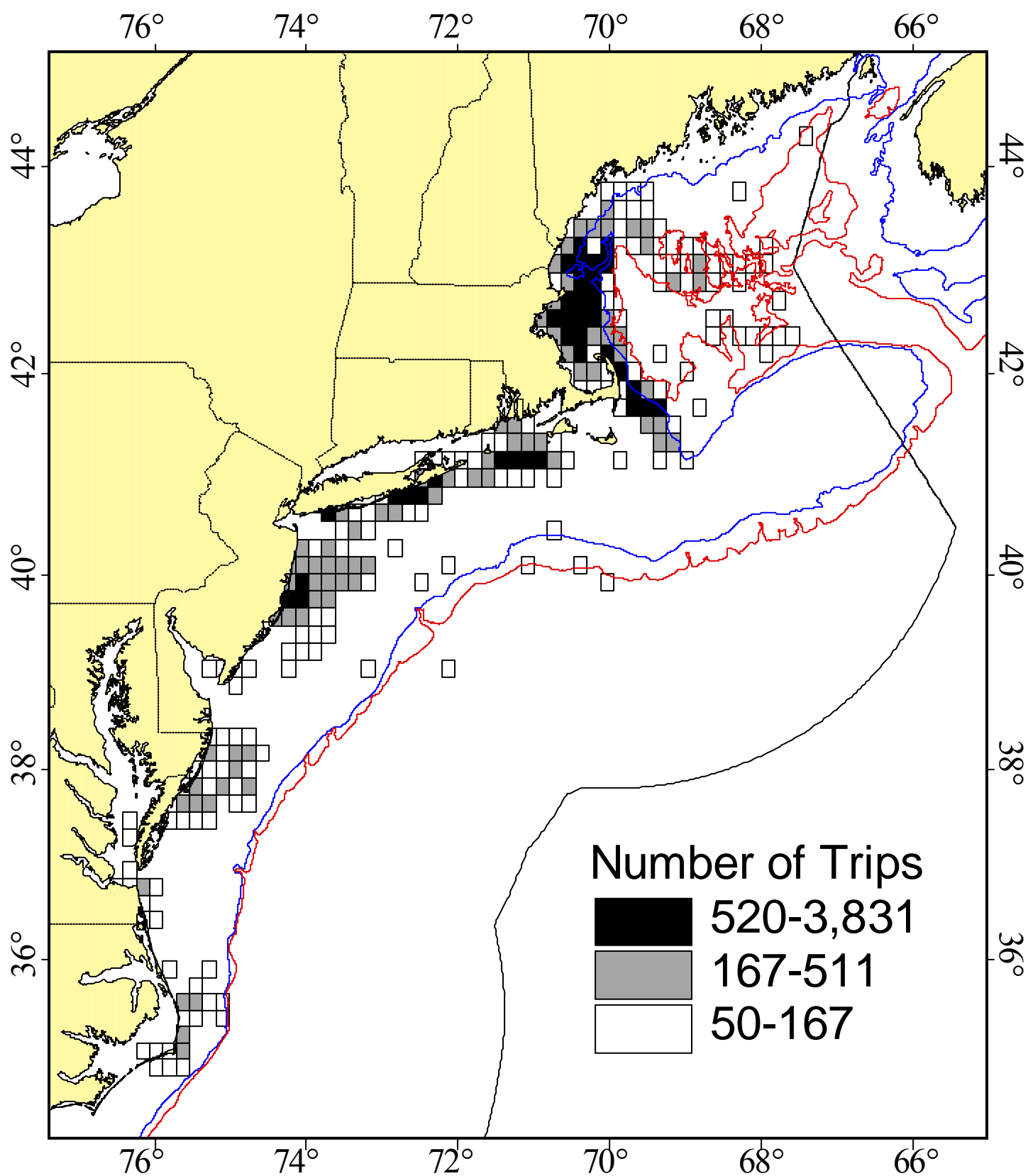


Figure 4.8. Bottom gill net fishing activity in the Northeast Region during 1995-2001. (Each TMS is associated with either a high (50% cumulative), medium (75% cumulative), or low (90% cumulative) category of fishing activity level (*i.e.*, number of trips). See the text for further explanation of cumulative percentages, or “percentiles,” and Table 4.3 for the ranges of fishing activity associated with each cumulative percentage category.)

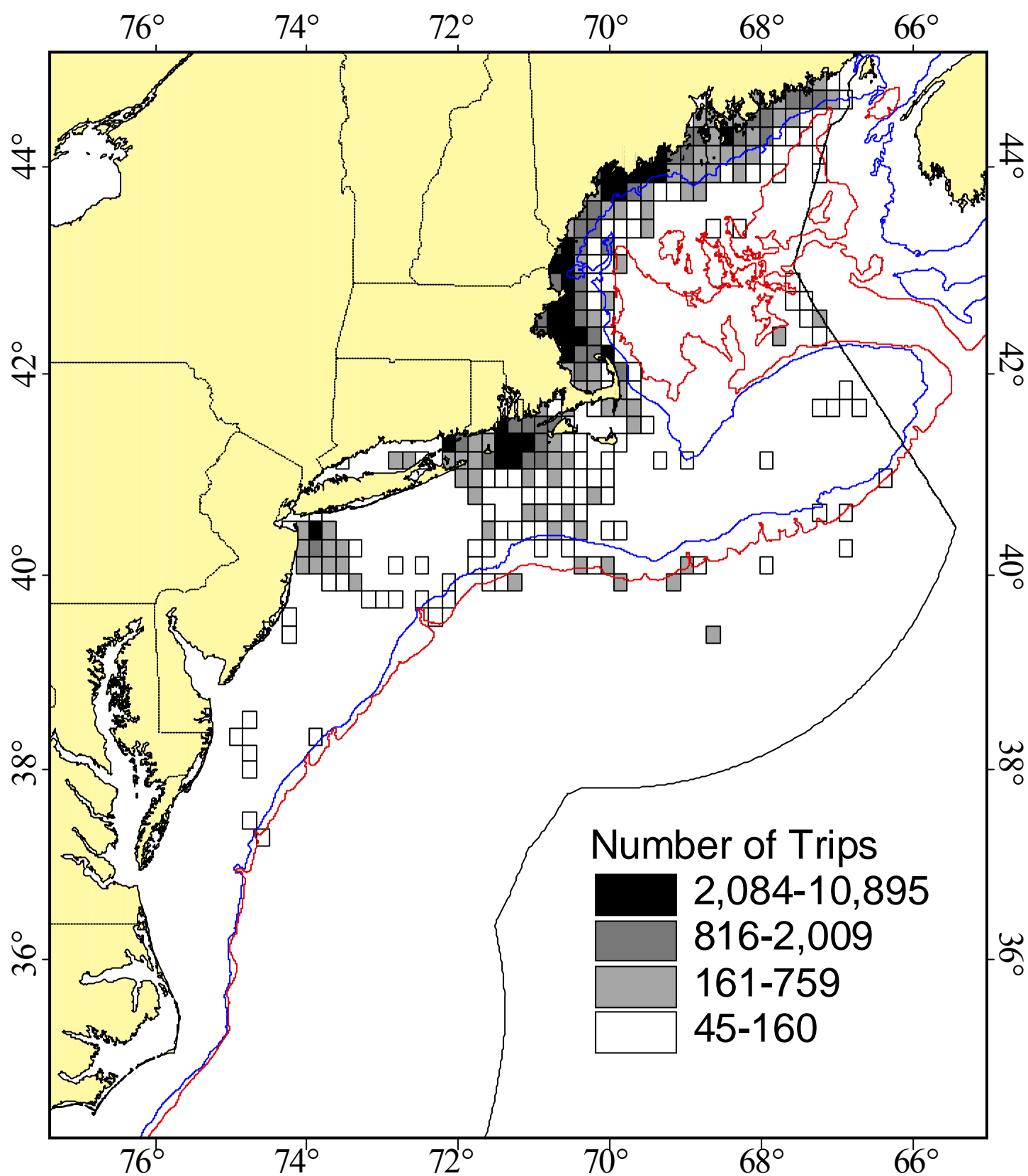


Figure 4.9. Lobster trap or pot fishing activity in the Northeast Region during 1995-2001. (Each TMS is associated with either a high (50% cumulative), medium (75% cumulative), low (90% cumulative), or very low (95% cumulative) category of fishing activity level (*i.e.*, number of trips). See the text for further explanation of cumulative percentages, or “percentiles,” and Table 4.3 for the ranges of fishing activity associated with each cumulative percentage category.)

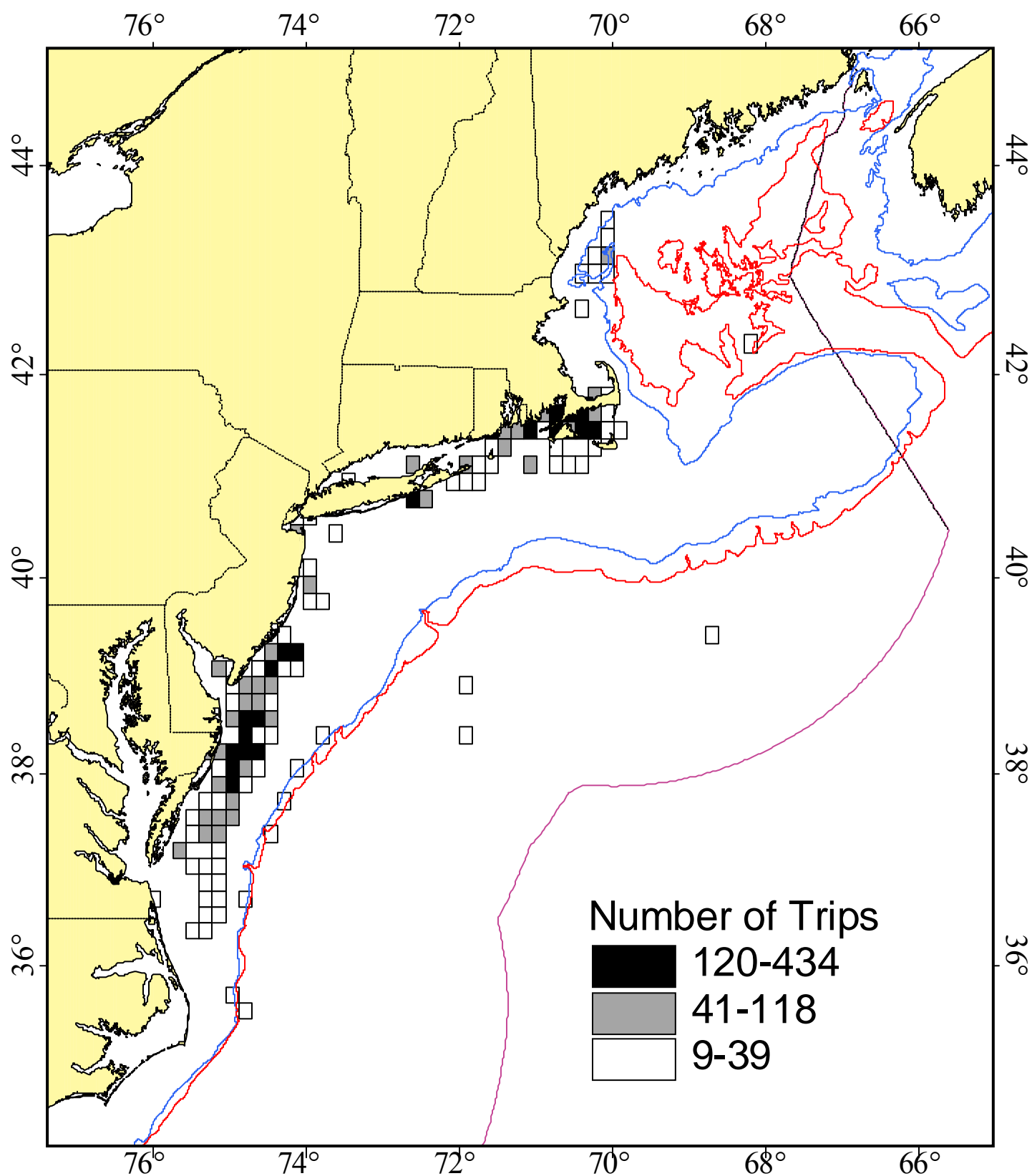


Figure 4.10. Fish pot fishing activity in the Northeast Region during 1995-2001. (Each TMS is associated with either a high (50% cumulative), medium (75% cumulative), or low (90% cumulative) category of fishing activity level (*i.e.*, number of trips). See the text for further explanation of cumulative percentages, or “percentiles,” and Table 4.3 for the ranges of fishing activity associated with each cumulative percentage category.)

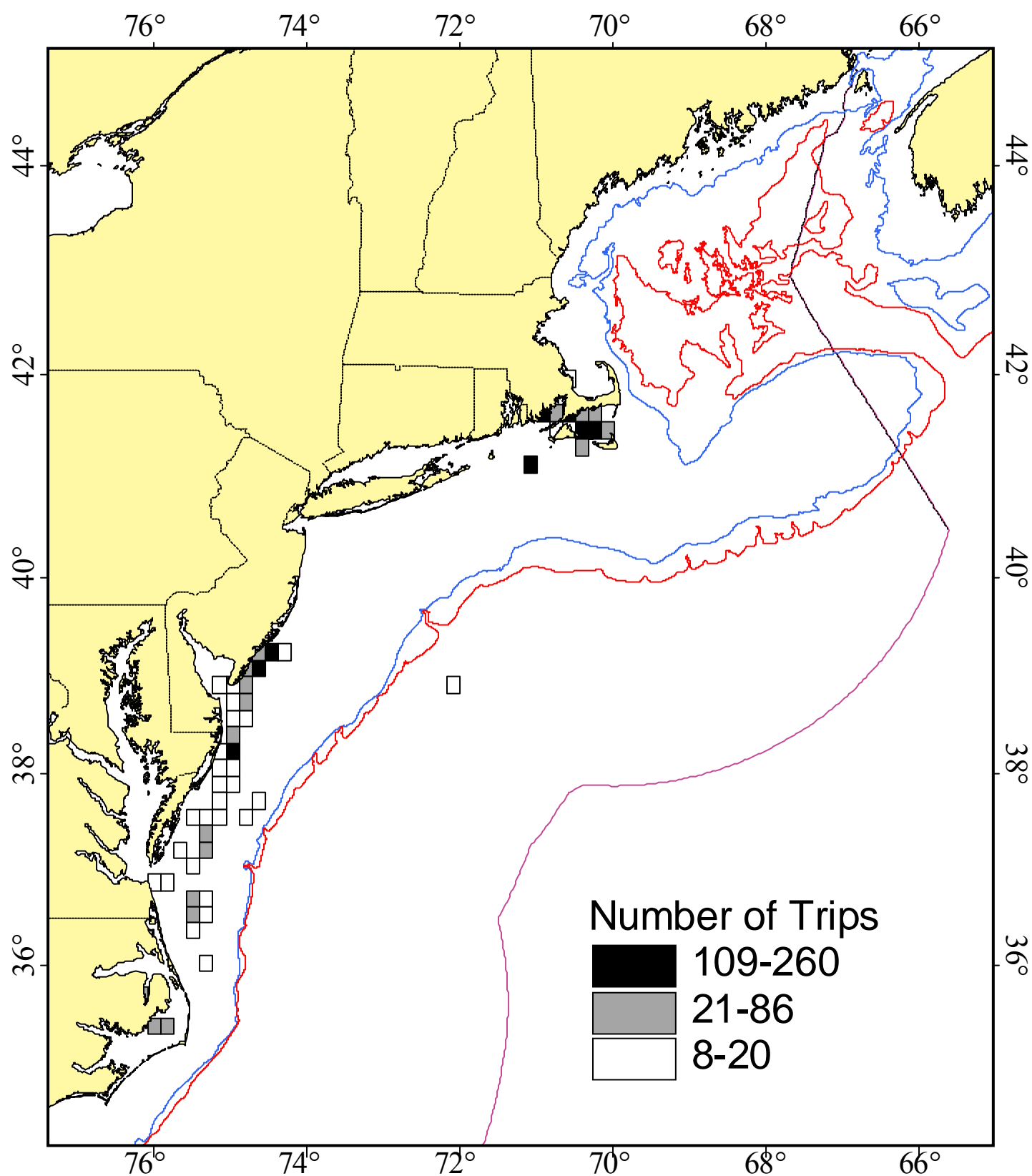


Figure 4.11. Whelk pot fishing activity in the Northeast Region during 1995-2001. (Each TMS is associated with either a high (50% cumulative), medium (75% cumulative), or low (90% cumulative) category of fishing activity level (*i.e.*, number of trips). See the text for further explanation of cumulative percentages, or “percentiles,” and Table 4.3 for the ranges of fishing activity associated with each cumulative percentage category.)

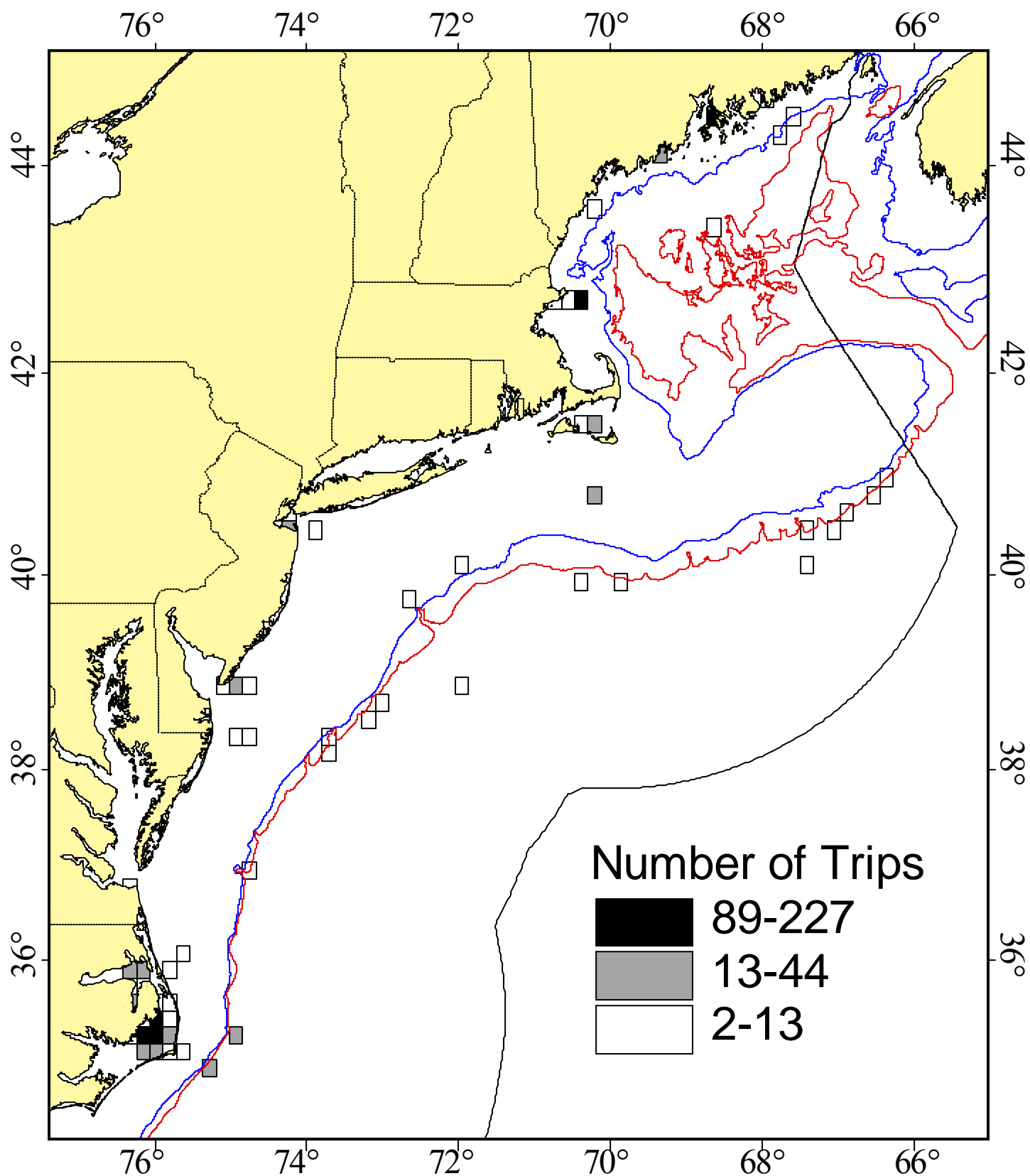


Figure 4.12. Crab pot fishing activity in the Northeast Region during 1995-2001. (Each TMS is associated with either a high (50% cumulative), medium (75% cumulative), or low (90% cumulative) category of fishing activity level (*i.e.*, number of trips). See the text for further explanation of cumulative percentages, or “percentiles,” and Table 4.3 for the ranges of fishing activity associated with each cumulative percentage category.)

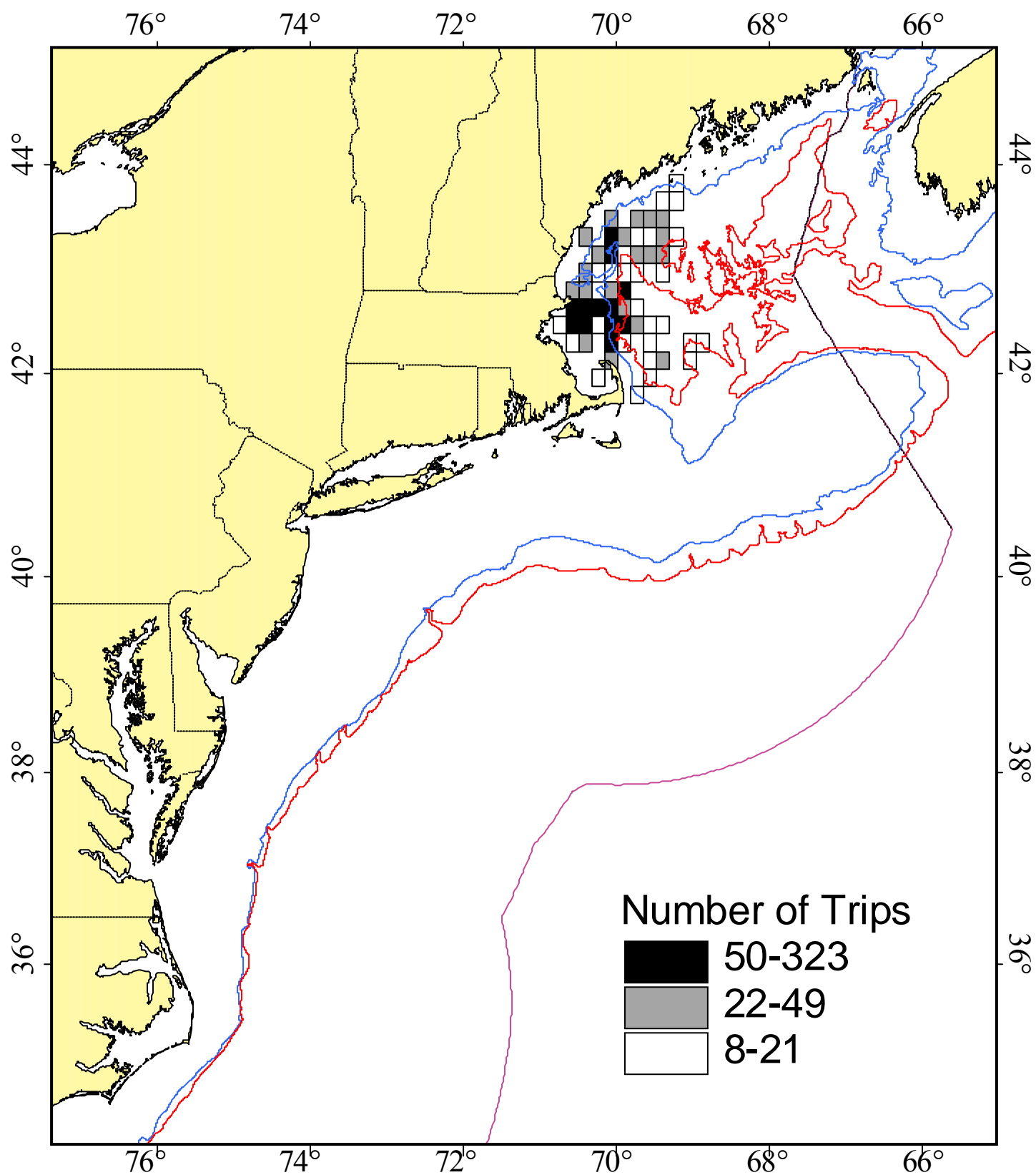


Figure 4.13. Hagfish pot fishing activity in the Northeast Region during 1995-2001. (Each TMS is associated with either a high (50% cumulative), medium (75% cumulative), or low (90% cumulative) category of fishing activity level (*i.e.*, number of trips). See the text for further explanation of cumulative percentages, or “percentiles,” and Table 4.3 for the ranges of fishing activity associated with each cumulative percentage category.)

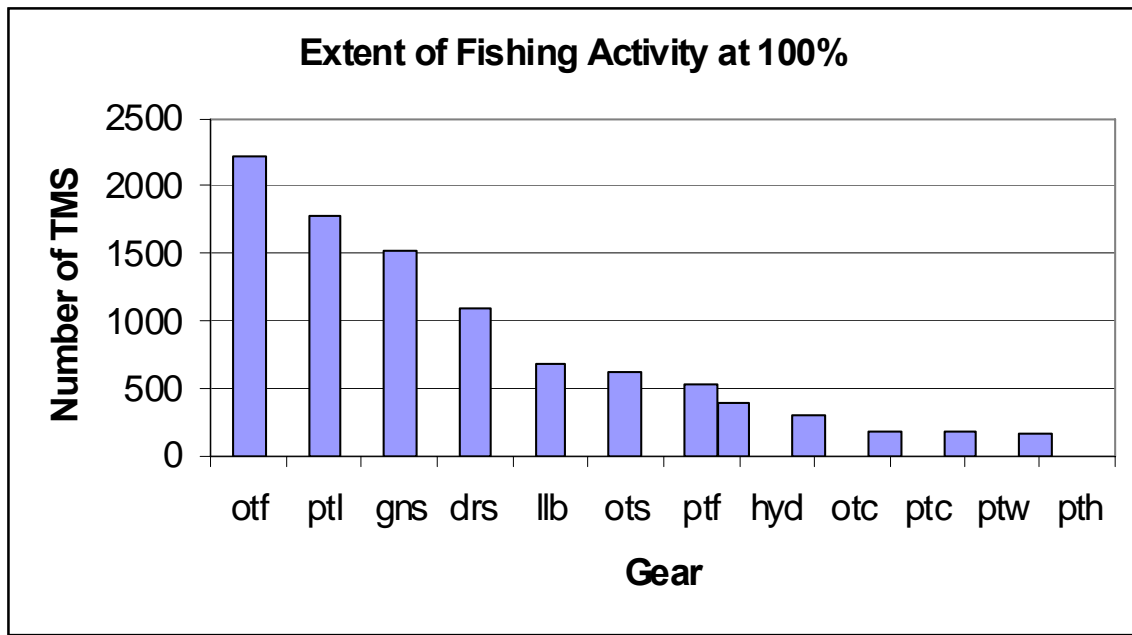


Figure 4.14. Number of 10' squares (TMSs) within which any amount of fishing activity was reported (*i.e.*, the 100th percentile) during 1995-2001 by gear type. (Note: Important to show because the maps stop at the 90th or 95th percentile, and do not show the full extent of fishing activity (*i.e.*, TMSs with just a small amount of activity, as well as TMSs with activity that is misreported by fishermen). Key: drs = New Bedford-style scallop dredge; gns = sink gill net; hyd = hydraulic clam dredge; llb = bottom longline; otc = otter trawl (scallop); of = otter trawl (fish); ots = otter trawl (shrimp); ptc = pots & traps (crab); ptf = pots & traps (fish); pth = pots & traps (hagfish); ptl = pots & traps (lobster); and ptw = pots & traps (whelk).)

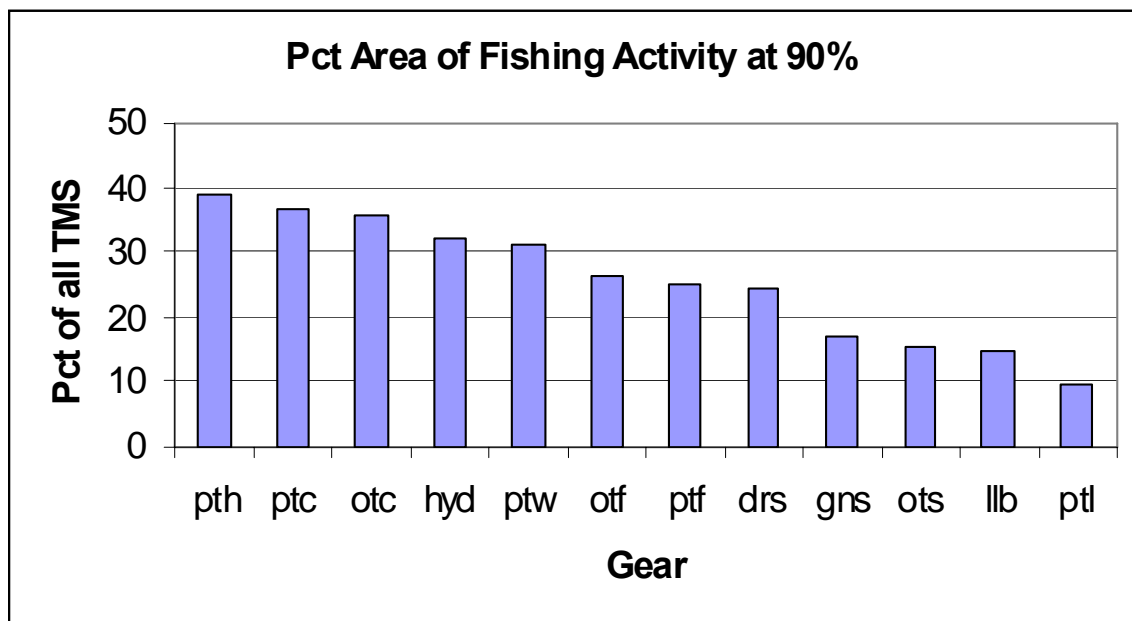


Figure 4.15. Proportion of area fished [all 10' squares] at the 90th percentile, an index of how evenly distributed the days or trips were among 10' squares, during 1995-2001 by gear type. (Note: For gears at the high end, most of the fishing activity was concentrated in a relatively small percentage of the total area fished (aggregated), and for gears at the low end, fishing activity was more evenly dispersed among TMSs. Key: drs = New Bedford-style scallop dredge; gns = sink gill net; hyd = hydraulic clam dredge; llb = bottom longline; otc = otter trawl (scallop); of = otter trawl (fish); ots = otter trawl (shrimp); ptc = pots & traps (crab); ptf = pots & traps (fish); pth = pots & traps (hagfish); ptl = pots & traps (lobster); and ptw = pots & traps (whelk).)